WHAT IS CLAIMED IS:

1. A filter device for being implanted in a blood vessel for carrying out *in-vivo* plasma separation comprising:

one or more elongated hollow tubes and a plurality of elongated microporous fibers having an interior lumen extending along the length thereof, each fiber having a first and second end secured to one or more of said elongated hollow tubes, wherein the interior lumen of each of the fibers communicates with the interior of one or more of the hollow tubes, and wherein the fiber wall morphology of each of the elongated microporous fibers is asymmetrical between the inner wall surface extending along the interior fiber lumen and the outer wall surface, said fiber wall having a higher mass density zone adjacent to the outer wall surface and a lower mass density zone adjacent to the inner wall surface, said higher mass density zone having a smaller average nominal pore size than the average nominal pore size in the lower mass density zone.

2. A filter device of Claim 1 comprising one or more first and one or more second elongated hollow tubes extending substantially parallel along the length thereof, and wherein a first end of each of said elongated microporous fibers is secured to a first hollow tube and a second end of each of said fibers is secured to a second hollow tube whereby the interior fiber lumen of each fiber communicates with the interior of a first and a second hollow tube.

3. A filter device of Claim 2 comprising two of said elongated hollow tubes, each of said tubes having a plurality of holes spaced apart along a substantial portion of the length thereof, each hole receiving a first or a second end of an elongated microporous fiber.

4. A filter device of Claim 2 wherein the first and second ends of said elongated microporous fibers are secured to said first and second elongated hollow tubes in generally straight rows along the side of each of said tubes.

5. A filter device of Claim 4 wherein the first hollow tube extends along a first axis and the second hollow tube extends along a second axis substantially parallel with said first axis, and wherein the first ends of said elongated microporous fibers are secured to said first hollow tube along a generally straight first row, and the second ends of said elongated

microporous fibers are secured to said second hollow tube along a generally straight second row substantially parallel with said first row.

6. A filter device of Claim 5 wherein the distance between said first and second rows is greater than the distance between said first and second axes.

7. A filter device of Claim 6 wherein each of said fibers are generally bowed along its length between said first and second ends to form an arch spaced apart from said elongated hollow tubes and forming a passageway therebetween.

8. A filter device of Claim 7 wherein said elongated microporous fibers comprise first and second fibers, said first fibers forming a first arch of spaced fibers extending over a first portion of said device, said second fibers forming a second arch extending over a second portion of said device, opposite the first portion, said first and second arches spaced apart from said elongated hollow tubes to form passageways therebetween.

9. A filter device of Claim 8 wherein first ends of first elongated microporous fibers are secured along a first row on a first hollow tube and second ends of first fibers are secured along a first row on a second hollow tube, and first ends of second fibers are secured along a second row on the first hollow tube and second ends of second fibers are secured along a second row on the second hollow tube,

whereby said first and second fibers form opposite first and second arches, respectively, of spaced fibers along said device.

10. A filter device of Claim 5, 6, 7, 8 or 9 wherein the first and second ends of said elongated microporous fibers are secured to said first and second hollow tubes, respectively, at substantially regular intervals.

11. A filter device of Claim 10 wherein said regular intervals are between about 0.1 cm and about 1.0 cm.

12. A filter device of Claim 10 wherein said regular intervals are between about 0.1 cm and about 0.3 cm.

13. A filter device of Claim 5, 6, 7, 8 or 9 wherein the length of each of said elongated microporous fibers is between about 1 cm and about 4 cm.

14. A filter device of Claim 11 wherein the length of each of said elongated microporous fibers is between about 1 cm and about 4 cm.

15. A filter device of Claim 5, 6, 7, 8 or 9 wherein the first end of each elongated microporous fiber is offset longitudinally from the second end of each said fiber along the length of said elongated hollow tubes whereby a straight line extending through the first and second end of a fiber forms an acute angle with one of said axes.

16. A filter device of Claim 15 wherein the space between adjacent fibers is between about 0.1 cm and about 1.0 cm.

17. A filter device of Claim 15 wherein the space between adjacent fibers is between about 0.1 cm and about 0.3 cm.

18. A filter device of Claim 15 wherein said acute angle is between about 45° and about 85°.

19. A filter device of Claim 15 wherein said first and second ends of said elongated microporous fibers are secured to said first and second hollow tubes, respectively, at substantially regular intervals.

20. A filter device of Claim 15 wherein the length of each hollow tube is between about 10 cm and about 25 cm.

21. A filter device of Claim 15 wherein the outer diameter of each hollow tube is between about 1 mm and about 3 mm.

22. A filter device of Claim 15 wherein the length of each elongated hollow fiber is between about 1 mm and about 4 mm.

23. A filter device of Claim 15 wherein the length of each hollow tube is between about 10 cm and about 25 cm, wherein the length of each elongated microporous fiber is between about 1 mm and about 4 mm, wherein the space between adjacent fibers is between about 0.1 cm and about 0.3 cm, and wherein said acute angle is between about 45° and about 85°.

24. A filter device of Claim 19 wherein adjacent first ends and adjacent second ends of said fibers are separated at regular intervals of between about 0.1 cm and about 0.3 cm.

25. A filter device of Claim 15 having between 4 and 8 fibers/cm of the length of said hollow tubes.

26. A filter device of Claim 15 having between 5 and 7 fibers/cm of the length of said hollow tubes.

27. A filter device of Claim 26 wherein the length of each of said hollow tubes along which said fibers are secured is between about 15 cm and about 25 cm.

28. A filter device of Claim 26 wherein the length of each of said hollow tubes along which said fibers are secured is between about 18 cm and about 22 cm.

29. A filter device of Claim 7 wherein the length of each of said hollow tubes along which fibers extend is between about 18 cm and about 22 cm and having about 6 fibers/cm of length of said hollow tubes, and wherein the space between adjacent fibers is between about 0.1 cm and about 1 cm.

30. A filter device of Claim 1 wherein said membrane fiber wall has two mass density zones and wherein each of said zones is characterized by a different average nominal pore size.

31. A filter device of Claim 1 wherein said membrane fiber wall has three mass density zones and wherein each of said zones is characterized by a different average nominal pore size.

32. A filter device of Claim 1 wherein said membrane fiber wall has four or more mass density zones and wherein each of said zones is characterized by a different average nominal pore size.

33. A filter device of Claim 30, 31 or 32 wherein said lower mass density zone is characterized by a nominal average pore diameter of between about 1 μm and about 60 μm.

34. A filter device of Claim 30, 31 or 32 wherein said higher mass density zone is characterized by a nominal average pore diameter of between about 0.3 μm and about 1 μm.

35. A filter device of Claim 33 wherein said higher mass density zone is characterized by a nominal average pore diameter of between about 0.3 μm and about 1 μm.

36. A filter device of Claim 30 wherein the nominal average pore diameter in said lower mass density zone is between about 2 μm and about 6 μm.

37. A filter device of Claim 30 wherein the nominal average pore diameter in said higher mass density zone is between about 0.4 μm and about 0.8 μm.

38. A filter device of Claim 36 wherein the nominal average pore diameter in said higher mass density zone is between about 0.4 μm and about 0.8 μm.

39. A filter device of Claim 38 having one or more intermediate mass density zones having a nominal average pore diameter of between about 0.8 μm and about 2 μm.

40. A filter device of Claim 39 having two intermediate mass density zones, a first intermediate zone having a nominal average pore diameter of between about 0.8 μm and about 1.2 μm and a second intermediate zone having a nominal average pore diameter of between about 1.2 μm and about 2 μm.

41. A filter device of Claim 33 capable of *in-vivo* ultrafiltration wherein said higher mass density zone is characterized by a nominal average pore diameter of between about 0.005 μm and about 0.05 μm.

42. A filter device of Claim 39 wherein said fibers comprise a polysulfone fiber.

43. A filter device of Claim 1, 15, 35 or 39 wherein the fiber wall structure comprises a continuous change in mass density between the inner and outer surfaces of the fiber.

44. A filter device of Claim 1, 15, 35 or 39 wherein distal and proximal elongated fibers are substantially filled with a synthetic resin.